

Claims

- [c1] A flexible natural gas storage facility comprising:
- at least one man-made salt cavern;
 - a pipeline source of a first fluid;
 - at least one high pressure compressor to compress the first fluid;
 - at least one heat exchanger to cool the first fluid from the compressor to a temperature that is compatible with the salt cavern, before the first fluid is placed in the salt cavern for storage;
 - a source of a second fluid;
 - at least one high pressure cryogenic pump to raise the pressure of the second fluid to dense phase; and
 - at least one Bishop Process™ heat exchanger to heat the second fluid to a temperature that is compatible with the salt cavern, before the second fluid is placed in the salt cavern for storage.
- [c2] The apparatus of claim 1 wherein the source of the second fluid is a LNG transport ship.
- [c3] The apparatus of claim 1 wherein the source of the second fluid is a conventional LNG receiving terminal.

[c4] The apparatus of claim 1 further including:
a first salt cavern to receive the compressed and cooled first fluid;
a second salt cavern to receive the pressurized and heated second fluid; and
a third salt cavern to receive portions of the compressed and cooled first fluid from the first salt cavern and portions of the pressurized and heated second fluid from the second salt cavern to adjust the Btu content of the blended fluids in the third salt cavern.

[c5] The apparatus of claim 1 further including at least one booster compressor to compress the second fluid from the Bishop Process™ heat exchanger before the second fluid is placed in the salt cavern for storage.

[c6] A flexible natural gas storage facility comprising:
at least one man-made salt cavern;
a pipeline source of a first fluid;
at least one high pressure compressor to compress the first fluid;
at least one heat exchanger to cool the first fluid from the compressor to a temperature that is compatible with the salt cavern, before the first fluid is placed the salt cavern for storage;
a source of a second fluid;
at least one high pressure cryogenic pump to raise the

pressure of the second fluid to dense phase; and
at least one high pressure vaporizer to heat the second fluid to a temperature that is compatible with the salt cavern, before the second fluid is placed in the salt cavern for storage.

[c7] The apparatus of claim 6 wherein the source of the second fluid is a LNG transport ship.

[c8] The apparatus of claim 6 wherein the source of the second fluid is a conventional LNG receiving terminal.

[c9] The apparatus of claim 6 further including:
a first salt cavern to receive the compressed and cooled first fluid;
a second salt cavern to receive the pressurized and heated second fluid; and
a third salt cavern to receive portions of the compressed and cooled first fluid from the first salt cavern and portions of the second fluid from the second salt cavern to adjust the Btu content of the blended fluids in the third salt cavern.

[c10] A method of storing natural gas comprising:
compressing a first fluid from a pipeline source of natural gas;
cooling the compressed first fluid to a temperature that

is compatible with a salt cavern;
injecting the cooled, compressed first fluid into at least one salt cavern;
pressurizing a second fluid from a LNG source to the dense phase;
heating the second fluid in a Bishop Process™ heat exchanger to a temperature that is compatible with a salt cavern;
injecting the second fluid into the salt cavern; and
releasing the cooled, compressed first fluid and the second fluid from the salt cavern into a pipeline for transport to market.

[c11] A method of storing natural gas comprising:
compressing a first fluid from a pipeline and raising the pressure to dense phase;
cooling the first fluid to a temperature that is compatible with a salt cavern;
injecting the first fluid into at least one salt cavern;
pressurizing a second fluid to the dense phase;
heating the second fluid in a Bishop Process™ heat exchanger to a temperature that is compatible with a salt cavern;
injecting the second fluid into the salt cavern; and
releasing the first fluid and the second fluid from the salt cavern into a pipeline for transport to market.

[c12] A method of storing natural gas comprising:
compressing a first fluid from a pipeline source of natural gas;
cooling the compressed first fluid to a temperature that is compatible with a salt cavern;
injecting the cooled, compressed first fluid into at least one salt cavern;
pressurizing a second fluid to the dense phase;
vaporizing the second fluid to raise the temperature to a temperature that is compatible with the salt cavern;
injecting the second fluid into the salt cavern; and
releasing the cooled, compressed first fluid and the second fluid from the salt cavern into a pipeline for transport to market.

[c13] A method of storing natural gas comprising:
compressing a first fluid from a pipeline and raising the pressure to dense phase;
cooling the first fluid to a temperature that is compatible with a salt cavern;
injecting the cooled, first fluid into at least one salt cavern;
pressurizing a second fluid to the dense phase;
vaporizing the second fluid to raise the temperature to a temperature that is compatible with the salt cavern;
injecting the second fluid into the salt cavern; and

releasing the cooled, first fluid and the second fluid from the salt cavern into a pipeline for transport to market.